You learn to speak by speaking, to study by studying, to run by running, to work by working; and just so, you learn to love by loving.
All those who think to learn in any other way deceive themselves.

– Francis de Sales

Agenda

- Packages
- Classic modules or Improvised Modules
- CommonJS (briefly)
- Assignment

JavaScript Modules

“Write code that is easy to delete, not easy to extend.”

What is a Module?

Modules are an integral piece of any robust application's architecture and typically help in keeping the units of code for a project both cleanly separated and organised.

Packages

What is a Package?

A package is a chunk of code that can be distributed (copied and installed). It may contain one or more modules and has information about which other packages it depends on.

NPM

NPM is a repository of JavaScript packages.

Installing Node.js - https://nodejs.org/en/download/

$ node -v
$ npm -v

Installing Packages in Local Mode

$ mkdir project && cd project
$ npm init -y
$ npm install --save lodash

Uninstalling Packages in Local Mode

$ npm uninstall lodash

Re-installing Project Dependencies

$ npm install

Classic Modules
or Improvised Modules

Improvised modules

The key hallmarks of a classic module are an outer function, which returns an "instance" of the module with one or more functions exposed that can operate on the module instance's internal (hidden) data.

```
const weekDay = function () {
   const names = ["Sunday", "Monday", "Tuesday",
"Wednesday","Thursday", "Friday", "Saturday"];
   return {
       name(number) { return names[number]; },
       number(name) { return names.indexOf(name); }
   };
}()

console.log(weekDay.name(1));
console.log(weekDay.number('Friday'));
```

CommonJS
classic Node.js modules

CommonJS

- With CommonJS, each JavaScript file stores modules in its own unique module context (just like wrapping it in a closure).
- No matter how many times you require(..) the same module, you just get additional references to the single shared module instance.
- CommonJS exports are exported as values not as references.

CommonJS

CommonJS uses **require(...)** to import dependencies and **module.exports** to expose something on the public API of the module.

```
const { maxBy } = require('lodash');

const add = (a, b) => a + b;
const subtract = (a, b) => a - b;
const multiply = (a, b) => a * b;
const divide = (a, b) => a / b;
const max = function(arr) {
    return maxBy(arr)
}
module.exports = {
   add,
   subtract,
   multiply,
   divide,
   max
}
```

ES Modules

ES Modules

- Static structure - It means that you can determine imports and exports at compile time (statically) – you only need to look at the source code, you don’t have to execute it.
- You can only import and export at the top level (never nested inside a conditional statement)
- import and export statements have no dynamic parts (no variables etc. are allowed)
- ES Module is file-based, and module instances are singletons

ES Modules

- ES Module uses “**import**” keyword to get dependencies and **“export”** keyword to expose something on the public API of the module.

```
import { maxBy } from 'lodash'

export const add = (a, b) => a + b;
export const subtract = (a, b) => a - b;
export const multiply = (a, b) => a * b;
export const divide = (a, b) => a / b;
export const max =  arr => maxBy(arr);

export default add;
```

Execution Order

ES modules act different as we would expect. The root cause is that **import** is not a function, but a **language keyword**. With language keywords the compiler can traverse and parse the whole application tree before executing it. Only a**fter traversing** does the compiler start executing them **from bottom to top**.

```
// index.js
console.log('loading module');
import './module';
console.log('module loaded');

// module.js
console.log('hello from module');

// hello from module
// loading module
// module loaded
```

Why use Modules?

Why use?

- **Maintainability –** Since modules are self-contained, they reduce the dependencies on parts of the codebase as much as possible to improve them independently.

Also, updating a single module is much more convenient than updating the complete code. Updating one module doesn’t affect the other modules.

Why use?

- **Namespacing –** Since variables outside the scope of a top-level function are global, it's common to have "namespace pollution" in our code. This means that totally unrelated code shares those global variables, creating confusion, resulting in unexpected outputs.

Modules help us avoid these situations by creating private space for the variables.

Why use?

- **Reusability –** JavaScript modules let us copy the previous code into our program and reuse it over and over again.

Writing the complete code for the same task is time-consuming; modules provide us with a better approach to optimize our code.

References for homework

(to read)

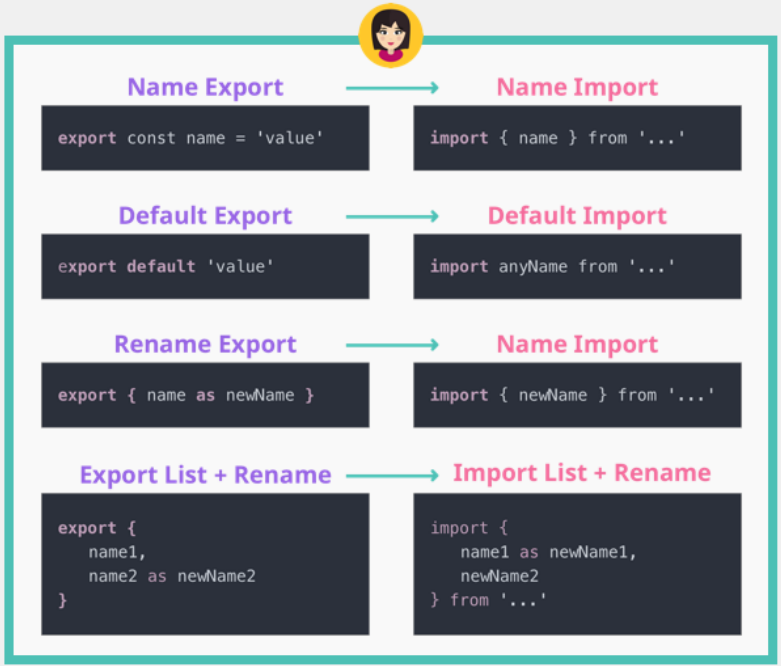
References

- https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide/Modules
- https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Statements/export
- https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Statements/import
- https://exploringjs.com/es6/ch_modules.html
- https://2ality.com/2014/09/es6-modules-final.html#more-on-importing-and-exporting

JavaScript

Module

Cheatsheet



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Assignment

Assignment – 1
Converting JavaScript Scripts to Modules

- https://developer.mozilla.org/en-US/docs/Games/Tutorials/2D_Breakout_game_pure_JavaScript

Analog clock - Assignment 2

Generate an analog clock using HTML, CSS and Javascript that has the following characterstics

Analog clock - Assignment 2

- Displays only 12, 3, 6, 9 as hours (as readable numbers)
- For all other hours it should display only a line
- For minutes a smaller line
- Hours hand is thicker
- Minutes hand is thinner
- Seconds hand is even thinner (and preferably a different color)

Analog clock - Assignment 2 – extra mile

- It should have a (stopwatch) button that does the following:
    - Sets a timer (e.g. 1 minute, 30 seconds, 2 minutes)
    - This should reset the hour and minutes hands to 12’ o clock
    - Spins only the seconds hand for as long as the stopwatch timer is set